Experimental Study of Concrete Using Crushed Over Burnt Clay Bricks

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Abstract- *Concrete is a homogeneous mixture of cement, sand, aggregate and water with specific proportion. The curing is required for hydration of cement, which effect on strength characteristics of concrete. Traditional curing method like ponding, spraying and plastic film are adequate for ordinary concrete but in high performance concrete and mass concreting work penetration of external water is difficult. This leads in cause serious premature cracks. Hence internal curing is an effective solution. The internal curing is done by providing water reservoir inside the concrete and by retention of water molecules of concrete. The aim of this investigation is to evaluate the use of crushed over burnt bricks (COBCB) as self- curing agent. This study also includes the effect of 12.5mm, 10mm, 4.75mm of COBCB by replacing coarse aggregate on the fresh and hard properties of concrete. The COBCB is replace by density ratio of COBCB and normal stone aggregate with addition of extra water. This experimental study were carried out to determine the effect of COBCB aggregate on compression, flexural and Spilt tensile strength properties of M25 grade concrete without curing. The COBCB has been used for replacement coarse aggregates in a ratios of 20%, 40% and 60 %.The results show that, the use of self-curing agents COBCB 10mm in concrete with replacement ratio 20% by volume of coarse aggregates is effectively improved the compressive strength of concrete*

Keywords- Internal Curing, Mechanical Properties, COBCB, Self- Curing Agent., mass concreting.

I. INTRODUCTION

From perspective of India, internal curing (IC) has a wide prospect. Due to the unavailability of modern equipment's, unskilled labor and most important is due water deficiency external curing process cannot be achieved properly in many instances. Hence internal curing is used to provide additional moisture in concrete to reduced self-desiccationand effective hydration of cement. Internal curing in concrete is usually ensured either by providing water reservoir in the concrete and retaining water molecules by use of chemical self-curing agent like Polyethylene Glycol-400.The primary reason of using LWA or SAP is that both of them can absorb water during mixing and eventually, transfer the absorbed water to the paste during hydration. Over burnt clay brick chips (BC) are very common in the country because of relative low cost and ease of availability.Many researchers have done the study on self-curing and publish their work in national/international conferences, journals and proceedings. Following are the literature review of some authors who have worked on the internal curing.

Biomaterials like Calatropis gigantean and palak green as self-curing agents, and it is compared with the performance of concrete with self-cure chemical, polyethylene glycol. Vegetative materials added as internal curing agents perform better workability, strength, and durability characteristics in fly ash based concrete of grades M20, M30 and M40[1].When mixing the two chemical curing agent used as 1% PEG and 0.01% PAM the mechanical properties of self curing concrete significantly improved as compared to conventional concrete [2].The strength of the specimen with 1% of PEG4000 increased when compared to the conventional specimen with M40. From 28 days flexural tensile strength results the specimen with 1% of PEG4000 decreased with a conventional specimen of M40 by 45.65%. From the 28 days splitting tensile strength results, the specimen with 1% of PEG4000 increased with a conventional specimen with by 22.22%.[3]..the self-curing agent is COBCB.it is used for replacement coarse aggregate in a ratio of 20%,50% and 100%.concrete subjected to different curing as conventional, air curing, and chemical curing .Concrete with replacement 20% of COBCB by volume of C.A.in concrete improves all mechanical properties in all curing condition.[5].When wood powder is added in the concrete with air curing the strength will be achieving. Increases mortar strength and early age strength sufficient to withstand strain when compared to the conventional concrete cubes. The 6% of wood powdered concrete cubes are compared to conventional concrete cubes is high compressive strength [6]. The conventional concrete and the self-curing concretes (with SF, Ch, and leca) exposed to 5% CO_2, improved in the compressive strength during the exposure period (6 months) due to pore filling process by carbon ions. The use of 15% silica fume and self-curing agents (2% polyethylene-glycol or 15% saturated leca) separately or

in conjunction in concrete mixes improves all properties of concretes under all curing regimes [7].

The primary focus of this project is to study the properties of internally cured concrete made with partial replacement of Coarse Aggregate with COBCB. Therefore, the following objectives were defined for this project work:-

- To develop procedure for making internally cured concrete with different portion of COBCB as partial replacement of Coarse Aggregate
- To investigate effectiveness of internal curing under different curing conditions
- To study the effect of internal curing agent on workability of concrete.
- To study the effect of internal curing on compressive strength of concrete at different days.
- To study the effect of internal curing on tensile strength of concrete at different days.
- To study the effect of internal curing on permeability of concrete.
- To conduct a study based on obtained results to recommend an optimum mix proportion for producing internally cured concrete.

II. EXPERIMENTAL DETAILS

2.1Concrete ingredients properties

For this experimental study, concrete is prepared from sand, cement, aggregate and water with COBCB aggregate. The cement used was ultratechordinaryPortland cement of 53 grades. Fine aggregate is taken from Godavari river bed sand and coarse aggregate are collected from local crushing plant. Over burnt clay bricks are collected from near village. This over burnt bricks crushed manually with the help of hammer and sieved to get required size of COBCB aggregate

2.2COBCB aggregate

This material produce by crashing of over burnt clay bricks. These types of bricks aredark in color and irregular in shape which is due to over burning .they are quite strong in compressive strength. These type of bricks are unfit for use in building construction. This is because of their irregular shape and size they are, however, very commonly used in a broken for in road contraction and flares as a course aggregate materials. A small quantity of lime is required in bricks earth. But if present in excess, it causes the bricks to melt and hence brick looses its shape. Different test conducted on concrete making material and result are summarized in tableno.1

Table 1: Test results of all concrete making material

Sr.no.	Test	I.S. code value	Result
	Cement	**IS 269-1976**	
1.	Fineness	< 10%	3.40 %
2.	Standard Const.		35%
3.	IST	>30	48 min
4.	Final Setting time	< 600	505 min
	Fine aggregate	**IS 383-1970**	
5.	Fineness Modulus		3.30
6.	Specific Gravity		2.60
7.	water absorption		3.21%
	Coarse aggregate	**IS 383-1970**	
8.	Fineness Modulus		5.52
9.	Specific Gravity		2.72
10.	water absorption		0.75%
11.	Bulk density	-----	1.659Kg/lit.
	COBCB	**IS 383-1970**	
12.	Impact test	<45%	38.88
13.	Bulk density		
	12.5mm		0.90 Kg/lit.
	10mm		0.92 Kg/lit.
	4.75mm		0.9566 Kg/lit.
14.	Specific Gravity		
	12.5mm		1.64
	10mm		1.68
	4.75mm		1.55
15.	water absorption		
	12.5 mm		8.75 %
	10 mm		9 %
	4.75 mm		13.70 %
16.	Abrasion test	<50%	30.6%

2.3Concrete mix design

It is the process selecting suitable ingredient with their determining proportion to achievestrength, durability and economy.The ingredients used for concrete mix design is cement, sand, coarse aggregate, water and COBCB.

The plan of this study is replace coarse aggregate by COBCB aggregate with different percentage of replacement say 20%, 40% and 60%.the replacement done by density ratio. Table 2 presents the concrete mix design results, for grade 25 concrete with water to cement ratio 0.5, using river bad sand and crushed stone.

Table 2: Test results of mix design (Grade-**M 25)**

Sr. no	Attribute	Value
1	Target Mean Strength (N/mm^2)	31.6
2	Cement (kg/m^3)	372
3	Coarse aggregate (kg/m^3)	1058.25
4	Fine Aggregate (kg/m^3)	799.84
5	Water (kg/m^3)	186

2.4Preparation of specimen

Conventional M25 grade concrete is design by using IS10262-2009.From this design I get quantity of coarse aggregate, fine aggregate, cement and water. Size of COBCB aggregates ranging between 20mm to 4.75 mm therefore, it is also divided into different grade. COBCB crushed and with the help of sieve divided into 12mm, 10mm and 4.75 mm.by density ratio coarse aggregate replace by COBCB aggregate from the water absorption of each grade COBCB extra water is added during mixing of concrete. Cube of size 150×150×150 mm, cylinder of size 150 mm diameter and 300mm height and beam of sizes 500×100×100 mm will be casted. Total specimen to be casted is 120. The specimen with COBCB is keep in air curing (in the laboratory at room temperature).

2.5Test method

To determine the properties of fresh concrete and hardened concrete slump cone test, compression strength test, spilt tensile strength test, flexural strength testand weight density are carried for all mixes at the age of 7, 28days.

III. EXPERIMENTAL RESULTS AND DISCUSSION

3.1Fresh concrete properties

The workability of concrete is check with the help of slump cone test.Figure1.Shows the result of slump cone test. From the figure No.1. it is clear that slump value of concrete increase with decreases in size of particle and with increasing % of replacement. So, the good workability of concrete is achieved by reducing the size of COBCBandby maintaining uniformity with sieve analysis.

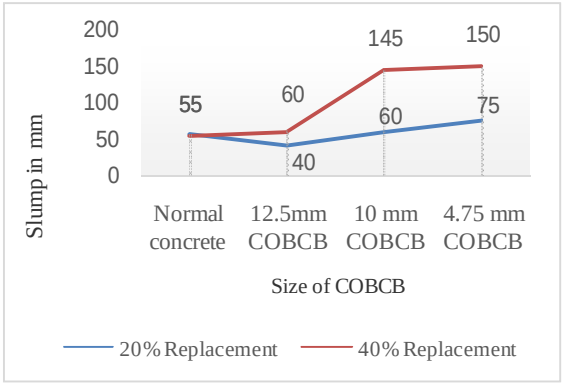

Figure.1 **Comparative slump cone test values of concrete**

3.2 Hardened concrete properties

3.2.1Compressive Strength of Concrete

The resultsof Compressive strength of Concrete cubes for various combinations of COBCB with coarse aggregate at 7 and 28 days strength are obtain as shown in below figure. 2. Shows the results of compressive strength of concrete with 20% replacement of COBCB. 10 mm COBCB with 20% replacement to normal aggregate gives maximum compressive strength. All test result of concrete sample is of without water curing.

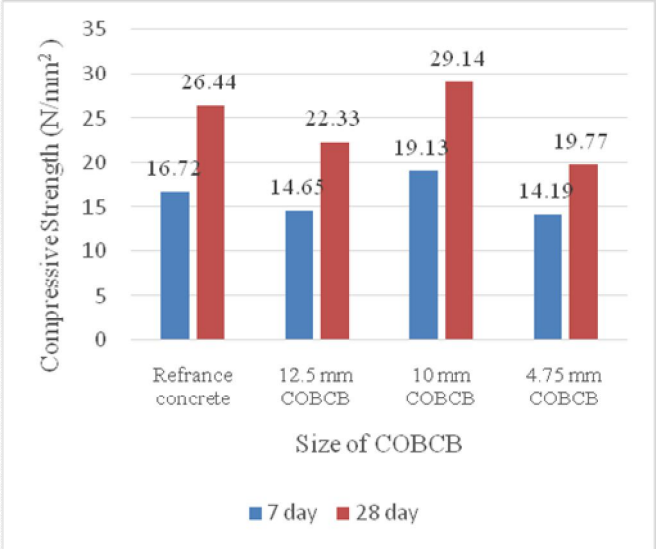

Figure.2Compressive Strength of Concrete with 20 % COBCB

Figure.3 shows the compressive strength of concrete with 40 %replacement of COBCB. As COBCB %increase the compressive strength of concrete decreases.

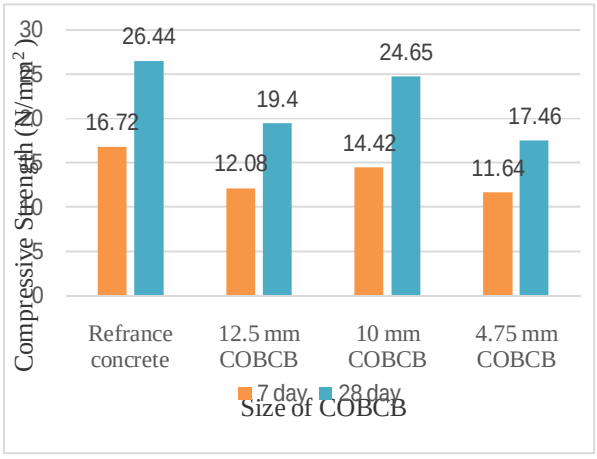

Figure.3Compressive Strength of Concrete with 40 % COBCB

3.2. Density of concrete

The COBCB material is light weight as compare to normal stone aggregate hence it affect the density of concrete. The density of concrete with different COBCB content is as shown in below figure.

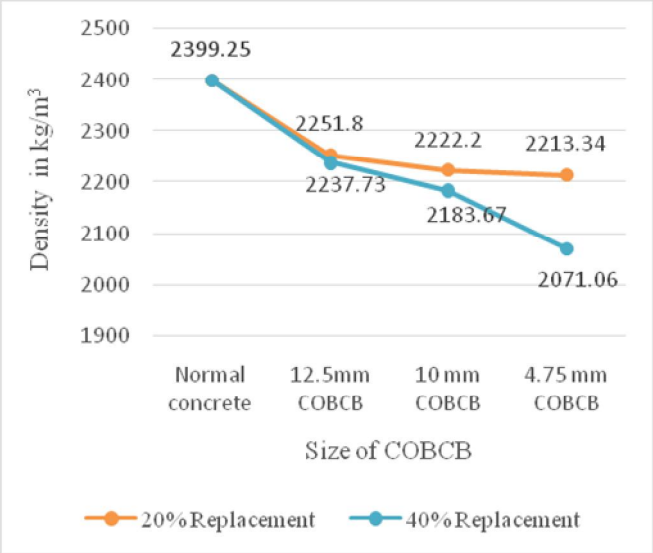

Fig.3Density of concrete with COBCB

IV. CONCLUSION

So from the experimental work, following conclusions have been drawn;

- Slump value of concrete increase with decreases in size of particle and with increasing % of replacement.
- Compressive strength of concrete is maximum at 20% replacement of 10mm COBCB to the normal aggregate.
- When 20% 10mm COBCB aggregate added in normal concrete compressive strength at 28 day increases by 10% as compare to reference concrete.
- Density of concrete decrease with decreases particle size and increase in %replacement.

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